

# CLAIMS

We Claim:

1. A wheat plant comprising at least one *Triticum aestivum* Brookton or Krichauff cultivar IMI nucleic acid, wherein the *Triticum aestivum* Brookton or Krichauff cultivar IMI nucleic acid confers upon the plant increased tolerance to an imidazolinone herbicide as compared to a wild-type variety of the plant.
2. The wheat plant of claim 1, wherein the at least one IMI nucleic acid is selected from the group consisting of an Imi1 nucleic acid, an Imi2 nucleic acid, and an Imi3 nucleic acid.
3. The wheat plant of claim 2, wherein the at least one IMI nucleic acid is an Imi1 nucleic acid.
4. The wheat plant of claim 2, wherein the at least one IMI nucleic acid is an Imi3 nucleic acid.
5. The wheat plant of claim 1, wherein the at least one IMI nucleic acid encodes an IMI polypeptide comprising a mutation in a conserved amino acid sequence selected from the group consisting of a Domain A, a Domain B, a Domain C, a Domain D and a Domain E.
6. The wheat plant of claim 5, wherein the conserved amino acid sequence is a Domain E.
7. The wheat plant of claim 6, wherein the mutation results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein.
8. The wheat plant of claim 1, wherein the at least one nucleic acid comprises a polynucleotide sequence selected from the group consisting of:
  - a) a polynucleotide as defined in SEQ ID NO:1;
  - b) a polynucleotide as defined in SEQ ID NO:3;

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- c) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2;
- d) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
- e) a polynucleotide comprising at least 60 consecutive nucleotides of any of a) through d) above; and
- f) a polynucleotide complementary to the polynucleotide of any of a) through e) above.

9. The wheat plant of claim 1, wherein the at least one IMI nucleic acid comprises a polynucleotide sequence as defined in SEQ ID NO:1.

10. The wheat plant of claim 1, wherein the at least one IMI nucleic acid comprises a polynucleotide sequence as defined in SEQ ID NO:3.

11. The wheat plant of claim 1, comprising two *Triticum aestivum* Brookton or Krichauff cultivar IMI nucleic acids.

12. The wheat plant of claim 11, comprising an Imi1 nucleic acid and an Imi3 nucleic acid.

13. The wheat plant of claim 1, comprising three IMI nucleic acids.

14. The wheat plant of claim 1, wherein the plant is not transgenic.

15. The wheat plant of claim 14, wherein the plant has an ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257; or is a recombinant or genetically engineered derivative of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257; or of any progeny of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257; or is a plant that is a progeny of any of these plants.

16. The wheat plant of claim 14, wherein the plant has an ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257, or is a progeny of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257.

17. The wheat plant of claim 14, wherein the plant has the herbicide resistance characteristics of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257.
18. The wheat plant of claim 14, wherein the wheat plant has an ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257.
19. The wheat plant of claim 1, wherein the imidazolinone herbicide is selected from the group consisting of 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid, 2-(4-isopropyl)-4-methyl-5-oxo-2-imidazolin-2-yl)-3-quinolinecarboxylic acid, 5-ethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-methylnicotinic acid, and a mixture of methyl 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-m-toluate and methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-p-toluate.
20. The wheat plant of claim 1, wherein the imidazolinone herbicide is 5-ethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid.
21. The wheat plant of claim 1, wherein the imidazolinone herbicide is 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinic acid.
22. A plant part of the wheat plant of claim 1.
23. A plant cell of the wheat plant of claim 1.
24. A seed produced by the wheat plant of claim 1.
25. The seed of claim 24, wherein the seed contains the at least one IMI nucleic acid and wherein the seed is true breeding for an increased resistance to an imidazolinone herbicide as compared to a wild type variety of the wheat plant seed.

26. A triticales plant comprising at least one *Triticum aestivum* Brookton or Krichauff cultivar IMI nucleic acid, wherein the IMI nucleic acid confers upon the plant increased tolerance to an imidazolinone herbicide as compared to a wild-type variety of the plant.
27. The triticales plant of Claim 26, wherein the at least one IMI nucleic acid is selected from the group consisting of an Imi2 nucleic acid and an Imi3 nucleic acid.
28. The triticales plant of Claim 27, wherein the at least one IMI nucleic acid is an Imi1 nucleic acid.
29. The triticales plant of Claim 27, wherein the at least one IMI nucleic acid is an Imi3 nucleic acid.
30. The triticales plant of Claim 26, wherein the at least one IMI nucleic acid encodes an IMI polypeptide comprising a mutation in a conserved amino acid sequence selected from the group consisting of a Domain A, a Domain B, a Domain C, a Domain D, and a Domain E.
31. The triticales plant of Claim 30, wherein the conserved amino acid sequence is a Domain E.
32. The triticales plant of Claim 31, wherein the mutation results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein.
33. The triticales plant of Claim 26, wherein the at least one IMI nucleic acid comprises a polynucleotide sequence selected from the group consisting of:
- a polynucleotide as defined in SEQ ID NO:1;
  - a polynucleotide as defined in SEQ ID NO:3;
  - a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2;
  - a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
  - a polynucleotide comprising at least 60 consecutive nucleotides of any of a) or d) above; and

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f) a polynucleotide complementary to the polynucleotide of any of a) through e) above.

34. The triticales plant of Claim 26, wherein the at least one IMI nucleic acid comprises a polynucleotide sequence as defined in SEQ ID NO:1.

35. The triticales plant of Claim 26, wherein the at least one IMI nucleic acid comprises a polynucleotide sequence as defined in SEQ ID NO:3.

36. The triticales plant of Claim 26, comprising two IMI nucleic acids.

37. The triticales plant of Claim 36, comprising a *Triticum aestivum* Brookton Imi1 nucleic acid and a *Triticum aestivum* Krichauff Imi3 nucleic acid.

38. A plant part of the triticales plant of Claim 26.

39. A plant cell of the triticales plant of Claim 26.

40. A seed produced by the triticales plant of Claim 26.

41. The seed of Claim 40, wherein the seed is true breeding for an increased tolerance to an imidazolinone herbicide as compared to a wild type variety of the triticales plant seed.

42. An isolated IMI nucleic acid, wherein the nucleic acid comprises a polynucleotide selected from the group consisting of:

- a) a polynucleotide as defined in SEQ ID NO:1;
- b) a polynucleotide as defined in SEQ ID NO:3;
- c) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2;
- d) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
- e) a polynucleotide comprising at least 60 consecutive nucleotides of any of a) through d) above; and

f) a polynucleotide complementary to the polynucleotide of any of a) through e) above.

43. The isolated IMI nucleic acid of claim 42, wherein the nucleic acid comprises a polynucleotide as defined in SEQ ID NO:1.

44. The isolated IMI nucleic acid of claim 42, wherein the nucleic acid comprises a polynucleotide as defined in SEQ ID NO:3.

45. The isolated IMI nucleic acid of claim 42, wherein the nucleic acid comprises a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2.

46. The isolated IMI nucleic acid of claim 42, wherein the nucleic acid comprises a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4.

47. A method of controlling weeds within the vicinity of a plant, comprising applying an imidazolinone herbicide to the weeds and the plant, wherein the plant has increased tolerance to the imidazolinone herbicide as compared to a wild type variety of the plant, and wherein the plant comprises at least one *Triticum aestivum* Brookton or Krichauff cultivar IMI nucleic acid.

48. The method of claim 47, wherein the at least one *Triticum aestivum* Brookton or Krichauff cultivar IMI nucleic acid is selected from the group consisting of an Imi1 nucleic acid, an Imi2 nucleic acid, and an Imi3 nucleic acid.

49. The method of claim 47, wherein the plant comprises an Imi1 nucleic acid and an Imi3 nucleic acid.

50. The method of claim 47, wherein the at least one IMI nucleic acid is selected from the group consisting of:

- a) a polynucleotide as defined in SEQ ID NO:1;
- b) a polynucleotide as defined in SEQ ID NO:3;
- c) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2;

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- d) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
- e) a polynucleotide comprising at least 60 consecutive nucleotides of any of a) through d) above; and
- f) a polynucleotide complementary to the polynucleotide of any of a) through e) above.

51. The method of claim 47, wherein the at least one IMI nucleic acid is an Imi3 nucleic acid.

52. The method of claim 47, wherein the at least one IMI nucleic acid is selected from the group consisting of:

- a) a polynucleotide as defined in SEQ ID NO:3;
- b) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
- c) a polynucleotide comprising at least 60 consecutive nucleotides of any of a) through b) above; and
- d) a polynucleotide complementary to the polynucleotide of any of a) through c) above.

53. A method of modifying a plant's tolerance to an imidazolinone herbicide comprising modifying the expression of at least one *Triticum aestivum* Brookton or Krichauff cultivar IMI nucleic acid.

54. The method of claim 53, wherein the at least one IMI nucleic acid is selected from the group consisting of an Imi1 nucleic acid, an Imi2 nucleic acid, and an Imi3 nucleic acid.

55. The method of claim 53, wherein the plant comprises an Imi1 nucleic acid and an Imi3 nucleic acid.

56. The method of claim 53, wherein the at least one IMI nucleic acid are selected from the group consisting of:

- a) a polynucleotide as defined in SEQ ID NO:1;
- b) a polynucleotide as defined in SEQ ID NO:3;

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- c) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2;
  - d) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
  - e) a polynucleotide comprising at least 60 consecutive nucleotides of any of a) through d) above; and
  - f) a polynucleotide complementary to the polynucleotide of any of a) through e) above.